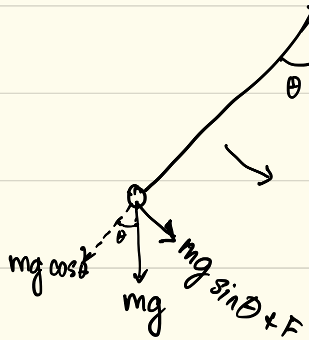


A pendulum has 2 forces:

- Centripetal (due to angular motion)
- Gravitational ($g = 9.8\,m/s^2$)

$$F + mg\sin\theta = 0 \rightarrow F = -mg\sin\theta$$

where $F = m.a = m.L.\alpha$

LINEAR ACCELERATION

ANGULAR ACCELERATION

$$\therefore \cancel{m}.L.\alpha = -\cancel{m}g\sin\theta \rightarrow \boxed{\alpha = -(g\sin\theta)/L}$$

ALSO: $\alpha = \dfrac{d^2\theta}{dt^2}$ (second derivative of θ vs time 't')

and $\omega = \dfrac{d\theta}{dt}$, where ω = ang. velocity

So, $\alpha = \dfrac{d\omega}{dt} \rightarrow \boxed{\alpha(\Delta t) = \Delta\omega}$

And $\boxed{\Delta\theta = \omega.\Delta t}$

NUMERICALLY: (For coding purposes):

1. WE CHOOSE A SMALL TIME INTERVAL Δt & any θ

2. CALCULATE $\alpha = -\dfrac{g \sin\theta}{L}$ at a given θ

3. $\Delta\omega = \alpha \cdot \Delta t$

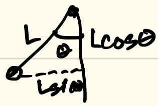
4. $\omega = \omega + \Delta\omega$

5. $\Delta\theta = \omega \cdot (\Delta t)$

6. $\theta_{new} = \theta + \Delta\theta$

7. CALCULATE NEW (x, y) POSITION AS FOLLOWS:

$$posX = x_{init} + L\sin\theta_{new}$$
$$posY = y_{init} + L\cos\theta_{new}$$



Repeat indefinitely or for a fixed time 't'

VOILA! pendulum oscillates!